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ANALYSIS OF PRESENT LAYOUT OF EASTERN TUBES LIMITED (ETL) AND SUGGESTION FOR FURTHER IMPROVEMENT

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ABSTRACT

Many industries are running their industry despite of huge wastage and production loss. There are many reasons of being closed down of these industries. Layout is one of the reasons. A proper layout can minimize the production loss and on the other hand an improper layout can increase the production loss. Layout refers to the specific configuration of physical facilities in an organization. Objective of layout strategy is to develop an effective and efficient layout that will meet the firm's competitive requirements. This project focuses on present layout and improvement of present layout of a local tube light company (Eastern Tubes Ltd.). During this project, the existing layout was studied and the problems of the existing layout were identified. Idle time and task time were calculated to find out the efficiency of existing and proposed layout. Key factors related to the layout of production floor were studied and by considering those factors, a new redesigned layout of the production floor was proposed in our study report.

KEYWORDS: Layout, Efficiency, Idle Time, Task Time

INTRODUCTION

It is clearly known that a proper layout system has a direct impact on any industries production system. Its overall profit largely depends on efficient layout system. An efficient layout on manufacturing function minimizes the material handling cost, minimize the production delay and minimize the bottle neck.

After the birth of Bangladesh in 1971 some heavy industries on agriculture fertilizers, steel, energy, etc. were established. Due to availability of cheap labor, establishment of export processing zone and BSCIC industrial areas, many garments, pharmaceuticals and other small scale industries have been established in the last 2-3 decades [1]. The present scenario of industries in Bangladesh have been shown in following table1.1[2] which indicates the amount of industries being shut down in previous years.

Table 1: Sector Corporations of Bangladesh

Name of the Corporation	Total Number of Industries in 70's	Presently Owned by the Corporation
Bangladesh Jute Mills Corporation(BJMC)	77	24
Bangladesh textile Mills Corporation(BTMC)	72	18
Bangladesh Sugar and Food Industries Corp.(BSFIC)	54	16
Bangladesh Steel & Engineering Corp.(BSEC)	54	12
Bangladesh Chemical Industries Crop.(BCIC)	13	13

From this above table 1 it is clearly notified that large number of Industrial Corporation has been closed down. There are many reasons of closing down the industries. The reasons might be management related, Financial, Technological, Environmental, Layout, location, material handling and others. Design of best layout directly related to the cost of the product. Sometimes material handling cost can go even up to 30% of production cost so design of best layout can directly minimize the material handling cost and therefore production cost [3]. Eastern Tube Light Limited (ETL) started its operation in 1964. With the machineries of Toshiba Corporation, Japan it started its production but later on in 1994 Toshiba Corporation, Japan visited this industry and declared this industry as sick industry but without any other means ETL is continuing its production [4]. There are many problems to declare this industry as sick like machineries, inefficient layout and others.

RESULT AND DISCUSSIONS

Problems in Existing Layout

Though product layout was the optimum option considering the facts of this production floor, we think there are some problems in this existing layout of production floor for manufacturing fluorescent tube-light. They are:

- The work material passing route between marking section and coating section is relatively higher; hence more time is required for tube-lights to be passed through.
- When coating operation is done, the tube lights are loaded on a conveyor which is both vertical and horizontal. The tube lights are passed through total 306 inch via conveyor to reach the baking section
- Again work materials are passed through 115 inch from exhaust machine to basing machine. Due to high distance, material handling time is higher.
- As most of the machines are of obsolete models, machine breakdown is a common incident in this production floor. Due to product layout system, breakdown of one machine causes the stoppage of whole production process.
- Even though a machine (x) is capable of getting sufficient input from previous machine (y), but because of high rate of waste in previous machine(y), the rate of input in machine (x) is comparatively low. Due to this reason, high wastes in one machine minimize the production.
- In this production floor, the final inspection system is located after the packaging section. Hence, some tube-lights are rejected even after the completion of packaging.
- When the tubes are coated into the coating section, per hour production rate is higher. But after the coating section, when the tubes are conveyed to baking section, per hour production rate is reduced. So, it is clear that bottleneck is created at baking section due to single baking machine.
- There is no ample space available for the storage of finished products.
- Inventory space for raw material is not sufficient enough to store.
- There is not enough space available for soldering operation.
- Proper ventilation system could not be maintained by this production system.

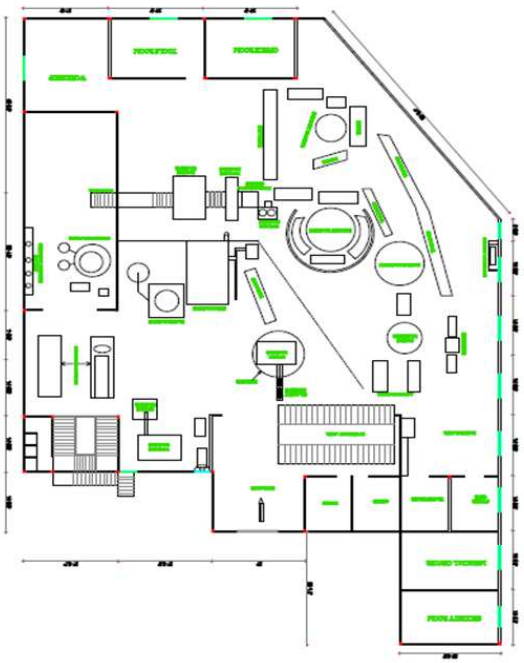

Figure 1: Existing layout of Eastern Tubes Limited

Efficiency Calculation for Existing Layout

In following **Table 2**, the average task time of individual machine, no of workers and Avg. Task time per workstation are enlisted, which are required for the calculation of efficiency.

Table 2: Average Task Time per Workstation

Workstation	Process	Average Task Time (min)	No. of Workers	Avg. Task Time per Workstation (min)
1.	Washing	0.80	1	0.80
2.	Drying	3.23	1	3.23
3.	Marking	0.52	1	0.52
4.	Coating	28	2	14
5.	Baking	10.5	1	10.5
6.	Necking	3.67	1	3.67
7.	Sealing 1	1.77	2	0.89
8.	Sealing 2	3.40	2	1.7
9.	Exhaust	7.80	3	2.6
10.	Basing 1	4.8	2	2.4
11.	Basing 2	2.58	2	1.29
12.	Soldering	0.5	1	0.5
13.	Aging	4.43	1	4.43

Total task time= Sum of all average individual task time per workstation= 46.53 min

Minimum Cycle time= Maximum average individual task time per workstation= 13 min

Idle time calculation (according to Existing Layout)

In following **Table 3**, the idle time for per workstation is identified by considering the maximum required time of the production system.

Table 3: Idle Time Calculation (Existing Layout)

Workstation	Process	Remaining Time (min)	Required Time	Idle time
1	Washing	14 min	0.80	13.2
2	Drying	14 min	3.23	10.77
3	Marking	14 min	0.52	13.48
4	Coating	14 min	14	0
5	Baking	14 min	10.5	3.5
6	Necking	14 min	3.67	10.33
7	Sealing 1	14 min	0.89	13.11
8	Sealing 2	14 min	1.7	12.3
9	Exhaust	14 min	2.6	11.4
10	Basing 1	14 min	2.4	11.6
11	Basing 2	14 min	1.29	12.71
12	Soldering	14 min	0.5	13.5
13	Aging	14 min	4.43	9.57

Total Ideal time = Sum of all idle times = 135.47 min

Percentage of idle time = $\frac{\text{Total Idle Time}}{\text{No of station} \times \text{Cycle Time}}$

$= \frac{135.47 \text{ min}}{13 \times 14} \times 100$

= 74.43 %

Efficiency= (100-74.43)

= 25.57 %

Proposed Layout

After finding out some problems and complications in the existing layout of manufacturing tube lights in ETL, we have studied to sort out the problems by modifying the layout of the production floor. The proposed layout has been designed by us considering following factors:

- An extra set of Coating, Baking and Necking machine has been incorporated. Hence the production floor is modified in parallel way (from Coating to Necking)
- Filament Making Section has been modified from L-shape production line to I-shape production line.

Improvement in Proposed Layout

Improvements have been found in the attached figure of proposed layout.

- There was no ample space available in the existing layout. But in the proposed layout we added the space for store the finished products.
- In the existing layout, there are some complications in matching the output of coating and input of baking machine. Two parallel lines of production can be proper solution to this problem, which has been proposed by us.
- In baking section, bottleneck arises. Due to bottleneck in baking section, operations in the whole remaining sections become slower. That's why, 2 parallel lines (from Coating to Baking section) can increase the speed of

machining operations.

- In the existing layout, the tubes pass a long way from coating to baking section (due to baking section's compatibility to take less input at once). But if two parallel lines are incorporated, the tubes of coating machine can be easily passed to two baking machines with less travel path (according to proposed layout)
- Again, according to present layout, the tube lights are passed from with exhaust machine to basing machine 1 with high travel path (L shape path). But according to our proposed layout, the distance is shortened.
- Due to two parallel lines' production, more products will be manufactured and thus ensuring better production rate of the factory.
- Productivity will be improved.
- The amount of time required for completing whole production process will be minimized.
- Due to new line of production, employment of more manpower can be ensured.
- Adequate space is achieved for free movements.

Figure 2: Proposed Layout of Eastern Tubes Limited

Efficiency Calculation for Proposed Layout

From task time for various stages of Fluorescent tube light production process, it was observed that a bottleneck operation exists in this production process. The prime bottleneck operation is occurred in Coating section. Due to long distance travelling between marking section and coating section, bottleneck is seen at coating section. The tubes travel a long distance between coating and baking section also; hence causing extra time to reach the next machining operation. Due to extra time requirement in this workstation other sections remain idle for longer time. As a result production is low.

According to our **"Proposed Layout",** we have minimized the distance between the marking and coating section. The distance between coating and baking section also minimized. We proposed double set of Coating, Baking and Necking

machines as parallel lines. Hence, the required time of this machining operations are minimized in following **table 4**

Table 4: New Required Time for 3 Workstations

Workstation	Process	Previous Required Time (Min)	New Required Time (According to Proposed Layout), min
1.	Coating	14	7
2.	Baking	10.5	5.25
3.	Necking	3.67	1.84

By improving the following factors, it is measured that the idle time in different workstations are reduced as shown in the **table 5**

Table 5: Idle Time Calculation (Proposed Layout)

Workstation	Process	Remaining Time (min)	Required Time	Idle Time
1.	Washing	7 min	0.80	6.2
2.	Drying	7 min	3.23	3.77
3.	Marking	7 min	0.52	6.48
4.	Coating	7 min	7	0
5.	Baking	7 min	5.25	1.75
6.	Necking	7 min	1.84	5.16
7.	Sealing 1	7 min	0.89	6.11
8.	Sealing 2	7 min	1.7	5.3
9.	Exhaust	7 min	2.6	4.4
10.	Basing 1	7 min	2.4	4.6
11.	Basing 2	7 min	1.29	5.71
12.	Soldering	7 min	0.5	6.5
13.	Aging	7 min	4.43	2.57

Total Ideal time = Sum of all idle times = 58.55 min

Percentage of idle time = $\frac{\text{Total Idle Time}}{\text{No of station} \times \text{Cycle Time}}$

$= \frac{58.55 \text{ min}}{13 \times 7} \times 100$

= 64.34 %

Efficiency= (100-64.34) %

= 35.66 %

Improvement in efficiency= (35.66-25.57) %

= 10.09 %

Hence, we can see that if the proposed layout is implemented in the Production system of Fluorescent Tube Light of ETL, the efficiency can be improved up to **10.09%.** Due to the increased efficiency of the production system, the productivity will increase annually.

CONCLUSIONS

Main concentration of this thesis was to analyze the existing layout of ETL and find out the best suited layout for this company which will make a direct impact in increasing productivity. There are so many problems in existing layout like-in this layout product has to travel a long distance. As all of the machines are backdated, their machining speed is so low. That's why production rate of this existing production line is alarmingly low. Due to existing layout wastage is increasing day by day. In the month of April wastage was 27.79%. It is a huge percentage of waste that decreases the productivity to approximately 70%. If this wastage can keep within 19.26% then productivity will be increased to 80.74% [5]

In existing layout from coating section to baking section product has to travel a long distance like 24.7feet. We recommend 10.7 feet from coating section to baking section. In another section, from exhaust machine to basing-1 product has to travel 11feet 8 inch. Also minimize this travel distance in proposed distance that will help to increase output. Flare machine, Mount machine, Stem machine are set in capricious way. We recommended 'I' shape production line for filament making. Therefore if proposed layout is implemented production rate will be increased and efficiency will be increased as well.

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REFERENCES

1. Hoque, A.K.M Solayman (2015), "Analyzing the problems of industries becoming sick and suggestions for improving the situation", Vol-01, pp. 10-12
2. Dey, R, "Introduction of new element of cost to method of industrial prices in Bangladesh", Chittagong University Studies, Commerce-Vol.-5, 1989, pp. 322-327.
3. Hoque, A.K.M Solayman and Biswas, S.K (2007), "Problems of Sick Industries- Bangladesh Perspective", Proceeding of the International Conference on Mechanical Engineering (ICME2007), Organized by BUET, ICME 07-AM-22, 29-31 December, Dhaka.
4. "Development Project Proposal(DPP) on Led Light Assembling Plant of of Eastern Tube Light Limited" by Ministry of Industry, Government of the people's republic of Bangladesh, pp. 7-18.
5. Motalib, A, et al., Biswas, S.K and, Solayman (2014), "Productivity Analysis and Suggestion for Improvement-A Case Study in A Local Company", Proceedings of the International Conference ICMIEE 2014, ICMIEE-PI-140339,25-26 December, Khulna, Bangladesh